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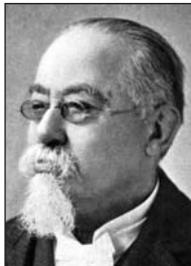
150th Anniversary
of Italian Unification

Italian pioneers of neuroscience

After Italian unification, declared on 17th March 1861 but not completed for several years, neurology became a clinical discipline, while this status was granted much later to neurosurgery, neuroradiology and other related neuroscientific discipline.

150 years after unification, however, it is fitting to acknowledge the contributions of some of the many pioneers in the field, paying tribute to the scientists whose birth roughly coincided with this historic event (with-

in an arc of roughly twenty years either side of 1861) and whose contributions significantly furthered progress in the neuroscience in the fledgling Italian nation. Inevitably, due to the several illustrious contributors to the scientific study of the nervous system in that period, the list of names is by no means comprehensive. Nevertheless, such an exercise does give a fascinating insight into how our forefathers shaped the neurosciences as we know them today.



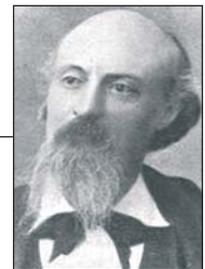
EZECHIA MARCO LOMBROSO, who later changed his name to **CESARE**
(born in Verona on 6th November 1835
and died in Turin on 19th October 1909)

He provided great impetus to clinical neurology, and he is recognized as having laid the foundations for a new discipline, *criminal anthropology*, having intuited a link between criminal behaviour and socio-educational background, even though he ascribed to the pseudoscientific theory that physical anomalies (*Lombrosian stigmata*) could explain the moral degeneration of the delinquent.



ACHILLE DE GIOVANNI
(born in Sabbioneta, Mantova province, on 28th September 1838
and died in Padua on 9th December 1916)

He studied alterations of the sympathetic system, which in his opinion could predispose a person to neurological diseases. He has been portrayed as the father of *Constitutional Medicine* in Italy; this school of thought, which opposed the concept of exclusively external causes of disease, an idea that had predominated during the flourishing of bacteriology. In this doctrine, the constitution, i.e., individual predisposition, also had a role to play in determining whether a person would or would not contract a certain illness.



LUIGI LUCIANI
(born in Ascoli Piceno on 23rd November 1840
and died in Rome on 23rd June 1919)

One of the most important Italian experimental physiologists, he hypothesized a cortical pathogenesis of epilepsy, conducted numerous experimental studies on cerebral localization, excising various regions of the brain, and made remarkable investigations into cerebellar function.





ANTONINO D'ANTONA

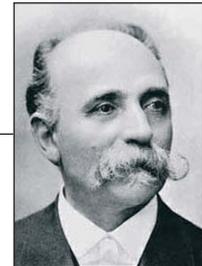
(born in Riesi, Caltanissetta province, on the 18th December 1842
and died in Naples on 21st December 1913)

Devoting himself to neurosurgery, he proposed a means of describing the skull and brain topography, based on lines traced on the head from very precise points that correspond to structures on the underlying brain tissue, and published a two-volume book entitled *La nuova chirurgia del sistema nervoso centrale* (*The new surgery of the central nervous system*).

BARTOLOMEO CAMILLO EMILIO GOLGI

(born in Córteno, Brescia province, on 7th July 1843
and died in Pavia on 21st January 1926)

He studied nervous tissue and discovered the silver chromate method of staining it (*the black reaction*, or *Golgi method*). In 1906, together with Giosuè Carducci, he was the first Italian to receive the Nobel Prize. This honour was awarded him jointly with Santiago Ramón y Cajal for their work on the histology of the nervous system, Golgi for his black stain and Cajal for the resulting discoveries. He was also responsible for classifying the cells of the nervous system based on the length of their axons (*Golgi type I and type II cells*), two types of sensory corpuscles in the tendons, a muscular tension receptor organ (*Golgi tendon organ*) and a pressure sensitive one (*Golgi-Mazzoni corpuscle*). He also explained the life cycle of the malaria parasite Plasmodium, and discovered the internal reticular apparatus of the cytoplasm (*Golgi body*).



ANGELO MOSSO

(born in Turin on 30th May 1846
and died in Turin on 24th November 1910)

He conducted research into fear, muscle fatigue and the relationship between intellectual activity and cerebral blood circulation under different operational conditions. He founded an international laboratory, at the foot of Monte Rosa, to enable the study of human pathophysiology at high altitudes. After a turbulent past and a long period of closure, the clinic was reopened roughly a decade ago.



LEONARDO BIANCHI

(born in San Bartolomeo in Galdo, Benevento province, on 5th April 1848
and died in Naples on 13th February 1927)

His most innovative and important research, based on experimental investigations, was aimed at discovering the localization of cerebral functions. By removing the frontal lobes from monkeys, he demonstrated that these parts are fundamental for perception, memory and voluntary behaviour. Subsequently he focussed on the study of brain-injured patients, showing that frontal lobe damage prevents them from mental effort and destroys their capacity for solving even simple problems. He described a clinical condition that still today bears his name (*Bianchi deep temporal lobe syndrome*), characterized by transitory hemiplegia, hemianaesthesia, astereognosia, alexia, agraphia, transitory verbal deafness, hemianopsia, disorientation and mental impairment.





AUGUSTO TAMBURINI

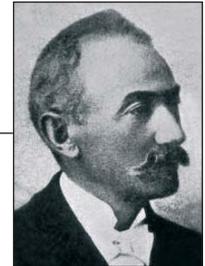
(born in Ancona on 18th August 1848
and died in Riccione on 28th July 1919)

He studied the issue of cerebral localization, particularly language disturbances, and campaigned tirelessly for social medicine, in particular for improvements in the conditions in psychiatric institutions.

VITTORIO MARCHI

(born in Novellara, Reggio Emilia province, on 30th May 1851
and died in Jesi, Ancona province, on 12th May 1908)

A histologist and collaborator of Luciani, among other discoveries he described the termination of muscle fibres in the tendons and came up with a method for staining myelin (*Marchi stain*), which coloured the products of disaggregation of the myelin sheath black but did not stain healthy fibres. This technique for selective staining of the central nervous system pathways enabled him to conduct important studies on the neurological anatomy and pathology.



ENRICO MORSELLI

(born in Modena on 17th July 1852
and died in Genoa on 18th February 1929)

His studies on the physiology of the sympathetic nervous system and epilepsy were among his most influential, along with his work on neuropsychological pathologies and physical anthropology. His research into suicide, analysing the link between suicide and occupation, in particular in the armed forces, is also worthy of a special mention.



EUGENIO TANZI

(born in Trieste on 26th January 1856
and died in Florence on 8th January 1934)

An authoritative supporter of the biological theory of psychiatry, he conducted innovative research on associative memory, muscular atrophy and hysteria. Together with his collaborator Ernesto Lugaro, he was one of the few Italian scientists to embrace Santiago Ramon y Cajal's *neuron theory* (in which neurons communicate via contact rather than continuity), which was destined to play such a fundamental role in the development of the neurosciences, criticizing the Camillo Golgi's *reticular theory* (neurites are fused together to form a continuous network similar to that of the arteries and veins). With Enrico Morselli and Augusto Tamburini he founded the *Rivista di Patologia Nervosa e Mentale* (*Journal of Neural and Mental Pathology*).



GIOVANNI MINGAZZINI

(born in Ancona on 15th February 1859
and died in Rome on 3rd December 1929)

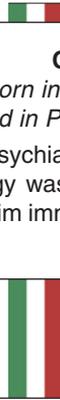
He devoted himself to studying the clinical anatomy of the nervous system, with particular attention to the aphasias, the physiology of the lentiform nucleus (eventually establishing the existence of a new syndrome also known as "*Mingazzini's lenticular hemiparesis*"), the cerebellum and the corpus callosum, and in his later years brain tumour pathology. He also described various neurological signs (*Mingazzini's signs*) and a supralenticular point (*Mingazzini's field*), at which the phasic motor fibres from the right hemisphere meet those from the left, that still bear his name.





CASIMIRO MONDINO
 (born in Turin on 21st April 1859
 and died in Pavia on 20th November 1924)

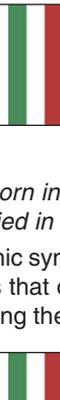
He studied first histology then psychiatry, and strove to equip Pavia University with a Neuropathology Clinic (neuropathology was used at that time to designate nervous system disease), which was named after him immediately after the First World War and still today bears his name.



GIUSEPPE D'ABUNDO

(born in Barletta, Bari province, on 21st February 1860
 and died in Naples on 29th December 1926)

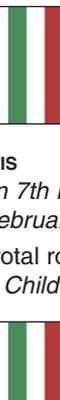
A protégé of Leonardo Bianchi, he founded a Neuropathology Clinic in Catania, deemed by his contemporaries as one of the most advanced and best equipped in Italy. He studied tabes, eye and pupil disorders in neurological syndromes, the anatomy of the cerebral lymphatic vessels, and experimental cerebral atrophy in newborn animals, demonstrating that the destruction of an area of cortex causes disturbances to normal function and arrested development, even in the contralateral side of the brain, and concomitant atrophy of the skull.



CAMILLO NEGRO

(born in Biella on 6th June 1861
 and died in Turin on 16th October 1927)

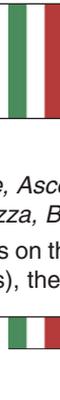
He worked in epilepsy, myasthenic syndromes, and neurological semiotics. He described various neurological signs, such as that of the *cogwheel phenomenon*, several of which still today bear his name. He was among the first to use film to document neurological pathologies.



SANTE DE SANCTIS

(born in Parrano, Terni province, on 7th February 1862
 and died in Rome on 20th February 1935)

A scholar under Giovanni Mingazzini, he played a pivotal role in the foundation and consolidation of Italian *Experimental Psychology*, as well as *Child Neuropsychiatry*.



ANGELO RUFFINI

(born in Pretare, Ascoli Piceno province, on 17th July 1864
 and died in Baragazza, Bologna province, on 7th September 1929)

He is remembered for his studies on the peripheral nervous system and the discovery of new nerve endings (mechanoreceptors), the so-called *Ruffini corpuscles*.



**CARLO CENI**

(born in Brignano d'Adda, Bergamo province, on 15th May 1865
and died in Bologna on 13th March 1965)

Known for his studies on epilepsy, he also undertook a series of experimental investigations on the relationships between the brain and the neuroendocrine system. He was convinced of the existence in the cerebral cortex of integrative vegetative centres with links to both the higher mental faculties and the endocrine function, and that these interactions gave rise to certain behaviours, such as maternal instinct. He discovered that mutilation of the part of the brain he pinpointed as regulating maternal function led to mental deficiencies and perverted sexual instincts.

**GIOVANNI BATTISTA PELLIZZI**

(born in Reggio Emilia on 25th May 1865
and died in Pisa on 5th November 1950)

By means of modifications to Golgi's methods, he studied the features of medullary sheath of the peripheral nerve fibres in detail. He also described the effects of cerebral and spinal lesions, and premature macrogenitosomia caused by pineal gland dysfunction, a form of premature puberty that is still known as *Pellizzi syndrome*.

**ARTURO DONAGGIO**

(born in Falconara Marittima, Ancona province, on 11th October 1868
and died in Bologna on 8th October 1942)

He introduced a histological method of staining neurofibrils and conducted important research on the structure of neurons, describing two laws that govern the pathology of the neurofibrillar "framework", an endocellular network that now bears his name (*Donaggio's network*). He also studied epilepsy, senile dementia, the after-effects of the encephalitis epidemic and occupational medicine issues.

**ERNESTO LUGARO**

(born in Palermo on 25th October 1870
and died in Salò, Brescia province, on 15th February 1940)

A disciple of Ernesto Tanzi, he was a psychiatrist and taught neuropathology, and arguing for the distinction between these two disciplines, as, according to him, neurological patients should not be treated in a psychiatric clinic. He made interesting observations on the macro- and microscopic structure of the brain, discovering the cerebellar cells that bear his name (*Lugaro cells*). He introduced the term "*plasticity*" in the neurosciences, and was the first to distinguish between "nervous conduction" (intraneuronal) and "nervous transmission" (interneuronal).

**GIUSEPPE LEVI**

(born in Trieste on the 14th October 1872
and died in Turin on 3rd February 1965)

He conducted important investigations into the morphology and biological properties of cells and tissues, in particular those of the nervous system. He was also the first in Italy to apply the *technique of in vitro culturing*. Three future Nobel prize-winners studied under him in the 1930s: Rita Levi Montalcini, Renato Dulbecco and Salvator Luria.





CARLO BESTA

(born in Teglio, Sondrio province, on 17th April 1876
and died in Milan on 26th December 1940)

He studied the pathways of cerebro-cerebellar association, epilepsy and parietal lesions, but his greatest contribution was comprehending the importance of a clinic entirely devoted to the neurosciences. He worked to set up a Neurosurgery Centre able to care for war wounded with brain injuries in one place, to guarantee them appropriate surgical treatment, physiotherapy and rehabilitation. He thus laid the foundations for a health service, which was continued in peace time, in a new specialized hospital centre, one that was named after him ten years following his demise.



MARIO BERTOLOTTI

(born in Turin on 7th July 1876
and died in Naples on 17th September 1957)

Trained as a neurologist, he later became a full professor of radiology and should be considered the founder of Italian neuroradiology, a term which he himself coined. Famous his studies on pneumoencephalography and internal frontal endocraniosis. He published a monograph entitled *Lezioni di craniologia Röntgen (Lessons in Röntgen Craniology)*. In a neurological context, in hemiplegia, he described a neurological sign that still bears his name (*Bertolotti-Valobra sign*), while in radiology, he describe a syndrome characterized by sacralization of the last lumbar vertebra (*Bertolotti's syndrome*) and a radiological sign of oesophageal cancer have been named after him.

(In the picture his autobiographical information for the new edition of "Biographisches Lexikon der hervorragenden Ärzte", 1930-1931. From the Waller Manuscript Collection, Uppsala University, Swedish).



OTTORINO ROSSI

(born in Solbiate Comasco, Como province, on 17th January 1877
and died in Pavia on 27th March 1936)

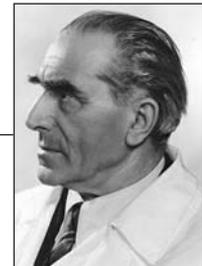
His contributions involved the identification of glucose as the reducing agent of the cerebrospinal fluid, and he demonstrated that fibres from the spinal ganglia pass into the dorsal branch of the spinal roots. He also studied cerebrovascular disease, neuroimmunopathology, the serodiagnosis of neurosyphilis, and the regeneration of the nervous system, among other topics. He advanced clinical semeiology, describing 3 extrapyramidal signs (*Rossi signs*) and the cerebellar signs of "the primary asymmetries of positions".



UGO CERLETTI

(born in Conegliano, Treviso province, on 26th September 1877
and died in Rome on 25th July 1963)

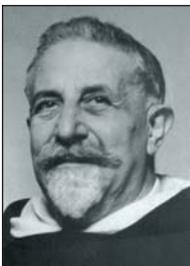
The author of brilliant clinical and experimental studies in neuropathology and neuropsychiatry, he introduced electroconvulsive shock treatment to medical practice.



ALBERTO MARIO CAMIS

(born in Venice on 31st May 1878
and died in Bologna on 28th August 1946)

A neurophysiologist with a particular interest in the vestibular system, he was the first to record electrical activity from the cerebellar fastigial nucleus after labyrinthine stimulation. He also discovered one of the features of spinal reflex excitation (*the phenomenon of occlusion*) and taught Giuseppe Moruzzi.




GAETANO PERUSINI

(born in Udine on 24th February 1879
and died in Cormons, Udine Province, on 8th December 1915)

He collaborated with Alois Alzheimer in his landmark research into dementia, and his contribution was fundamental for the definitive description of the disease, which for a short time was correctly known as "Alzheimer-Perusini disease".

Author: Angela Verlicchi

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